CLAIMS

1. A method for receiving uplink data messages at a base station, without collisions, from a plurality of remote units, the method comprising:

assigning a plurality of unique uplink request signals to a plurality of remote units, including a first unique uplink request signal to a first remote unit and a second unique uplink request signal to a second remote unit;

monitoring the plurality of unique uplink request signals;

simultaneously receiving monitored unique uplink request signals, including the first and second unique uplink request signals;

in response to receiving the first and second unique uplink request signals, determining that the first and second remote units have data messages to transmit uplink; and

authorizing the transmission of uplink data messages from the first and second remote units to the base station.

2. The method of claim 1 wherein a plurality of frequency tones are included, and in which the assignment of a unique uplink request signal includes assigning a frequency tone from the plurality of frequency tones to each of the first plurality of remote units.

3. The method of claim 1 wherein a plurality of time slots are included, and in which the assignment of a unique uplink request

signal includes assigning a time slot from the plurality of time slots to each of the plurality of remote units.

4. The method of claim 1 wherein a plurality of spreading codes are included, and in which the assignment of the unique uplink request signal includes assigning a spreading code from the plurality of spreading codes to each of the plurality of remote units.

5. The method of claim 2 further comprising:

establishing an arbitration state, the establishment of the arbitration state including:

transmitting a request for unique uplink request signals from the plurality of remote units; and

in response to the request for unique uplink request signals, monitoring the plurality of unique uplink request signals for a response; and

the method further comprising:

establishing a data transfer state including:

sending instructions to the first and second remote units for the transmission of uplink data messages; and

receiving the uplink data messages from the first and second remote units.

6. The method of claim 5 in which the requesting of uplink request signals includes transmitting an arbitration state signal to the plurality of remote units.

7. The method of claim 6 in which the sending of instructions to the first and second remote unit for the transmission of uplink data messages includes transmitting a data transfer signal to the first and second remote units.

8. The method of claim 7 in which the assignment of frequency tones from the plurality of frequency tones to a plurality of remote units includes the plurality of frequency tones being orthogonal to one another with respect to frequency.

9. The method of claim 8 in which the simultaneous reception of the monitored unique uplink request signals includes simultaneously receiving orthogonal frequency tones.

10. The method of claim 9 further comprising:

simultaneously receiving orthogonal frequency tones in a plurality of time slots.

11. The method of claim 10 further comprising:

following the reception of the monitored unique uplink request signals, and preceding the establishment of the data transfer state, organizing a first sequence of remote unit uplink data message transmissions;

in which the sending of instructions for the transmission of uplink data messages includes granting permission to transmit uplink data messages in the first sequence; and

in which the reception of the uplink data messages includes receiving uplink data messages in the first sequence.

12. The method of claim 11 in which the establishment of the data transfer state includes:

decoding the uplink data messages;

sending decode status messages indicating whether the uplink data messages have been unsuccessfully decoded;

following the data transfer state, generating another request for unique uplink request signals from the plurality of remote units;

monitoring the plurality of unique uplink request signals; and

in response to sending unsuccessful decode messages, receiving unique uplink request signals requesting permission to retransmit uplink data messages from the remote units.

13. The method of claim 7 in which the simultaneous reception of the monitored unique uplink request signals includes transmitting frequency tones from the plurality of frequency tones having a random phase relationship to one another.

14. The method of claim 11 further comprising:

assigning each of the plurality of remote units a unique identification;

tracking requests to uplink data messages, and assigning the uplink data messages in a sequence using the remote unit identification; and

in which the assignment of a unique identification to each remote unit includes selecting an identification scheme from the group including remote unit identification numbers and an identification based on each remote unit having a unique combination of frequency tones and time slots.

15. The method of claim 10 in which the assignment of frequency tones from the plurality of frequency tones to a plurality of remote units includes assigning at least two tones from the plurality of frequency tones to each remote unit from the plurality of remote units.

16. A method for a remote unit to uplink data messages to a base station without collisions, the method comprising:

receiving a request for unique uplink request signals;

in response to the request for unique uplink request signals, transmitting a unique frequency tone when the remote unit has a message to uplink; and

in response to transmitting the unique frequency tone, receiving instructions for sending the uplink data message.

17. The method of claim 16 further comprising:

in response to the request for unique uplink request signals, transmitting unique frequency tones in a predetermined time slot.

18. A method for communicating comprising:

creating a first time slot to accept signal transmissions;

measuring the energy in a first frequency band in which transmissions are received;

measuring the energy in a second frequency band in which transmissions are not received;

comparing the energy measured in the first and second frequency bands; and

in response to the comparison, determining whether a signal has been transmitted.

19. A method for receiving uplink data messages at a base station from a plurality of remote units without collisions, the method comprising:

assigning a unique uplink request signal from a first plurality of orthogonal signals to each remote unit from a first plurality of remote units;

monitoring unique uplink request signals;

simultaneously receiving a second plurality of unique uplink request signals, from among the first plurality of assigned unique uplink request signals, which correspond to a second plurality of remote units from among the first plurality of remote units; and

in response to receiving the second plurality of unique uplink request signals, organizing a collision-free sequence of uplink data messages from the second plurality of remote units.

20. A method for a base station to identify a remote unit, the method comprising:

assigning a plurality of unique identification signals to a plurality of remote units, including a first unique identification signal to a first remote unit;

monitoring the unique identification signals;

in response to receiving the first unique identification signal, identifying the first remote unit.

21. The method of claim 20 wherein a plurality of frequency tones is included, and in which the assignment of a unique identification signal includes assigning a frequency tone from plurality of frequency tones to the first remote unit.

22. The method of claim 21 in which the assignment of a frequency tone from the plurality of frequency tones includes the plurality of frequency tones being orthogonal to each other.

23. The method of claim 21 wherein a plurality of time slots is included, and in which the assignment of a unique identification signal includes assigning a time slot from the plurality of time slots to the first remote unit.

24. The method of claim 21 wherein a plurality of spreading codes is included, and in which the assignment of a unique

identification signal includes assigning a spreading code from the plurality of spreading codes to the first remote unit.

25. A communication system for receiving uplink data messages at a base station without collisions, the system comprising:

a base station having a port to transmit and receive messages, the base station establishing an arbitration state to request unique uplink request signals and to monitor unique uplink request signals;

a first remote unit having a port in communication with the base station to transmit and receive messages, the first remote unit transmitting a first unique uplink request signal to the base station in response to receiving the request for unique uplink request signals;

a second remote unit having a port in communication with the base station to transmit and receive messages, the second remote unit transmitting a second unique uplink request signal to the base station in response to receiving the request for unique uplink request signals; and

in which the base station monitors unique uplink request signals received simultaneously from the first and second remote units.

26. The system of claim 25 in which the base station, in response to receiving the first and second unique uplink request signals, establishes a data transfer state to receive the uplink data messages from the first and second remote units in a non-interfering sequence; and

in which the first and second remote units transmit uplink data messages in response to uplink instructions from the base station.

27. The system of claim 26 further comprising:

a plurality of remote units, including the first and second remote units, communicating with the base station to receive requests for unique uplink request signals, each one of the plurality of remote units transmitting a unique uplink request signal which represents a request to uplink a data message, and each one of the plurality of remote units receiving uplink data message transmission instructions from the base station in response to that remote unit transmitting its unique uplink request signal.

28. The system of claim 27 in which the unique uplink request signal of each of the plurality of remote units includes a frequency tone selected from a plurality of unique frequency tones.

29. The system of claim 28 in which each of the plurality of frequency tones is orthogonal to one another with respect to frequency.

30. The system of claim 27 in which the unique uplink request signal of each of the plurality of remote units includes the assignment of a spreading code from a plurality of unique spreading codes.

31. The system of claim 27 in which each of the plurality of remote units has a unique identifier; and

in which the base station uses the remote unit unique identifiers in transmissions to provide uplink data message sequence instructions to the remote units.

32. The system of claim 31 in which the unique identification for each of the plurality of remote units is selected from the group including remote unit identification numbers and an identification based on each remote unit having a unique uplink request signal.

33. The system of claim 31 in which the base station decodes each uplink data message and transmits a decode status indicating whether the uplink data message has been successfully decoded.

34. The system of claim 29 in which unique uplink request signals from the plurality of remote units include simultaneous frequency tone transmissions from the plurality of frequency tones having a random phase relationship to one another.

35. The system of claim 27 in which the unique uplink request signal of each of the plurality of remote units includes the assignment a time slot selected from a plurality of time slots.

~~36~~ A remote unit for transmitting requests to uplink data message to a base station without collisions, the remote unit comprising:

a receiver having an input to accept solicitations for unique uplink request signals; and

a transmitter having an output to provide a first frequency tone, selected from a plurality of orthogonal frequency tones, which uniquely identifies the remote unit, the transmitter sending the first frequency tone in response to the solicitation of unique uplink request signals, to indicate the existence of a data message for transmission uplink.

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